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PHYSIOLOGICAL DIFFERENTIATION IN OVERWINTERING INDIVIDUAL OF CERTAIN MUSICAL ORTHOPTERA.

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It is well known that many of the crickets and katydids are not as uniform in their mass population as external morphological characters such as the systematist deals with would make them appear. The sequences of the seasons have made possible certain physiological segregations and expressions both in plants and animals. The winter annual among plants is well known, for it is the survival of a plant over the winter in the vegetative condition, usually in the immature rosette stage. As soon as the spring opens these chilled and sluggish plants start into growth and mature their seed in advance of seed sown in the springtime. The Annual Larkspur is a notable example of one of these. Not all plants normally produce winter annuals, for it is evident a plant must possess a high degree of cold resistance.

We have similar conditions among our crickets, katydids and locusts. There may be a winter-annual phase among them which is but the survival of immature stages; or farther southward the adult itself may survive. A number of our musical crickets and katydids carry a certain proportion of nymphs over the winter. Among these are the common field crickets of the species *Gryllus assimilis pennsylvanicus*, Burm., and it would appear the tiny cricket (*Anaxipha exigua*, Say.) and in the South the Coneheaded Katydid (*Neoconocephalus triops*, Linn.).

This winter-annual or overwintering condition has tended to segregate the species into two more or less clearly defined physiological forms, which in some instances have come to be rather strikingly differentiated in many respects. From the fact that stridulation or mechanical sound-production has become a remarkable feature of self-expression among the Orthoptera, this becomes a striking index, in some instances, of what is taking place even though the morphological picture remains unchanged.

We may first consider the common Field Cricket (*Gryllus assimilis pennsylvanicus*) in the eastern portions of its range. In the region from Washington northward, physiological differentiation appears to have remained a minor matter in all the details of behavior. The typical intermittent chirp is the characteristic note of the overwintering spring brood, and is indistinguishable from the chirping of the late summer and autumn brood. In all the features of behavior, habitat, etc., the two broods appear to be as identical as they are in all their external morphological characters which the systematist would care to consider.

Somewhere south of the Washington latitude, the matter becomes more complicated. In the Northern Georgia region, at Thompson's Mills, near Hosch-

ton, physiological specialization and differentiation takes a somewhat more pronounced aspect. The same cricket occurs here abundantly, but the spring brood appearing in the adult stage in April, behaves differently and "sings" differently from the summer brood hatching later in the season from overwintering eggs. They become shy, furtive crickets inclined to dwell in burrows and out-of-the-way nooks among the clods and soil. The stridulation, however, is a striking departure from the usual cricket chirp. It has become a low, weak continuous trilling, more like the trill of the Four-spotted Tree Cricket (*Oecanthus nigricornis quadripunctatus*,) than any *Gryllus*. I have never heard this continuous trilling after midsummer, and there appears to be no intermingling with the true chirping form of the summer and autumn brood. The crickets ostensibly become silent, or they die, having lived their allotted span of weeks and days, as it is reasonable to believe. It is my experience that no normal musical cricket or katydid is inclined to become voluntarily silent while he can shuffle one wing noisily upon the other. Here, then, somewhere southward, musical specialization has taken place in the direction of a continuous unbroken trill. Beyond this there is little in the behavior and nothing in the systematic characters which would serve to differentiate the two broods, for their habitat relations are very similar. The range of this form has not been worked out, but there is reason to believe it extends beyond the Thompson's Mills region.

We will now consider the tiny Bush Cricket (*Anaxipha exigua*,) which has produced a comparable physiological overwintering form, but some steps farther removed from the summer brood in certain behavior characteristic than *Gryllus assimilis pennsylvanicus* has evolved.

This little cricket in the east ranges from New England to Florida and Texas. In the Washington region the winter has finally determined the occurrence of a spring brood beginning to sing in May and continuing to sing well into June. By midsummer it becomes silent, and toward late July and August the midsummer brood has produced singing adults. Physiological differentiation has become very marked here, for there is a complete change in the choice of habitat, in the vertical range of distribution in the herbage and in the stridulation and behavior. Again the "song" of the spring race is a weak, continuous trill resembling that of a *Nemobius* such as *Nemobius palustris* Blatchley of cold northern bogs, while the song of the midsummer brood is an interrupted tinkling ti-ti-ti-ti. Most remarkable is the complete adoption of a restricted bog-habitat with the ground-cover consisting largely of an admixture of the following plants: *Sphagnum*, Lizard's Tail (*Saururus cernuus* L.), Golden Club (*Orontium aquaticum* L.), Groundnut (*Apios tuberosa* Moench), *Juncus effusus* L., *Glyceria nervata* (Willd) Trin, *Scirpus*, *Luzula juncooides*, *Carex intumescens* Rudge, *Carex virescens* Muhl, *Carex lurida* Wahlenb, *Carex straminea* Willd, *Carex stipata* Muhl.

This spring race dwells deep down in the dead ground material of this vegetation covering, and is for that reason exceedingly difficult to locate and capture although in some seasons myriads may be heard singing in certain bogs until the air seems aquiver with their shrill blending music.

In their behavior these crickets are very shy, retiring and never ascend the

vegetation, but cling tenaciously to the decaying ground detritus as the species of *Nemobius* are wont to do. This is a striking departure from the behavior of the late summer forms which are never found in these same bog habitats. They persistently shun the dead ground material and show a decided inclination to distribute themselves vertically in the herb and shrub habitat, keeping hidden in the foliage of the upper zone of herbage, vines, shrubs, even ascending low trees in some instances. Thus has this *Anaxipha exigua* assemblage somehow evolved two distinct physiological groups, restricting themselves rigidly in time, place, behavior, song, etc., for, so far as I have determined there is no overlapping, but a distinct interval of silence intervening between the periods of musical expression of the two broods. Notwithstanding these marked physiological departures authorities can detect no morphological distinctions. The species to the classificationist, morphologically is a unit; to the field-naturalist seeing and hearing critically, it is physiologically a variable.

There are probably deep laws of life involved here, but the mystery of it all is why there is not some confusion, some intermingling in the more superficial musical expressions of this generalized physiological differentiation. Why does each group sing so rigidly with its own style of music? Why should an overwintering brood so rigidly trill, and the summer brood so rigidly chirp? There appears to be nothing fundamentally exclusive in the intermittent chirp or the continuous trill. One would not think of a different muscular mechanism for each of these. One would expect to find something in the psychology apart from the morphology, external or internal, which would regulate these impulses toward a broken or rhythmic sequence of similar sounds, or a continuous whirr of sound without rhythm.

There is much yet to be known of these overwintering broods and their physiological potentialities as compared with the summer broods. In the case of *Gryllus assimilis pennsylvanicus*, the two broods appear to be of equal importance in point of numbers, general adaptiveness, etc. This applies to the Washington region and northward where diverse singing forms have not arisen. In the case of the little *Anaxipha exigua*, the spring race appears to represent a small and restricted group as compared with the great typical species-assemblage which appears everywhere from July till frost.

I am inclined to believe the morphological species-assemblage is one thing, and the physiological potentialities of expression within it another. If there were some reliable readily measurable physiological index at hand, it is possible there would be revealed fundamental points of distinction between the spring forms and the more typical summer broods with respect to temperature, light, food, behavior, etc. If the overwintering forms are identical in all their physiological potentialities with the summer broods, then restrictions of habitat, differences of habit, musical impulse, etc. are expressions of the impress of environment. Surely nymphs overwintering underground, subjected for months to low temperatures, without light and restricted in activity and diet, are given extremes of environmental conditions which a brood born from eggs in the warm springtime, with abundance of food, long hours of day light, high temperatures, freedom, etc. has never known. If it is this and nothing more, the environmental complex truly has a remarkable impress, changing the intermittent chirp to a trill, changing per-

menently the type of behavior, the choice of the habitat, etc. If on the other hand we look upon it all as internal, specific, then certain forms overwinter, choose restricted habitats, "sing" differently, etc. because they have a fundamentally different physiological heredity and adaptiveness and survive because they do not have the same physiological requirements as the summer broods. It is possible low temperature levels, low light values, etc. constitute an environment which can produce marked modifications in the developing individual. Observations of a Meadow Katydid (*Orchelimum agile*) which the writer kept through the entire winter may throw some light on these responses.

Whatever the significance of these spring and summer broods among the crickets it is evident that there is a tendency toward definite physiological differentiation in some instances involving many features of the living behavior and habitat relationships. The seasonal shift in these elements of the population while showing no observable effects upon the external morphology has somehow induced profound physiological specialization in many directions, and that is just what should be expected of the infinite plasticities of the organic complex.

With respect to differences in the habit of stridulation of some species there appear to be discernible geographic variations as well as seasonal variations within restricted local groups such as the writer has observed with *Gryllus* and *Anaxipha*. To the writer's ear, the stridulations of the Oblong-winged Katydid (*Amblycorypha oblongifolia*) as heard in southern New England have a distinctiveness in delivery and rasp that distinguishes them from the notes of the same species in the Washington region and southward. Snodgrass in his excellent paper "Insect Musicians, Their Music and Their Instruments," in the Smithsonian Report for 1923 pp. 405-452, has noted these geographic differences in the character of stridulation of the True Katydid (*Perophylla camellifolia*). He says "it is very noticeable that the song of the katydids about Washington is much less harsh and grating on one than is that of the New Englanders." The writer agrees with these observations, and nothing is more evident than that insects have their vernaculars as well as humans. If the old resident New Englander has a vernacular which distinguishes him from the native South Carolinian, it holds just as truly for some katydids and crickets. No one has satisfactorily explained all these localisms and provincialisms, but I doubt not certain subtle environmental differences of life, climate, etc. are in large part responsible which we have not yet come to evaluate in our larger analyses of physiological and morphological expression. It is a property not only of insects, but of men, birds, frogs and toads. Fowler's toad (*Bufo fowleri*) appears to have no distinct morphological unity which will decisively distinguish it from the common toad (*Bufo lentiginosus*) yet the former has a weird brief droning scream for its song, and the latter produces a soft, musical trilling monotone continued for 15 or 20 seconds. It has been reported that certain species of birds sing better in some localities than in others, for instance the Nightingale.

It is evident, then, that subtle physiological differentiation is likely to confront the field naturalist at every turn, regardless of the morphological unity of species. It is well that this is so, and the sooner the naturalist recognizes the fact that the same organic complex is perhaps capable of many subtle languages, habitat-relations, etc. the sooner will he have gained a correct appreciation of the subtle plasticities of life.

A FEW MATCH BRUSH APHIDS FROM UTAH¹.

BY H. J. PACK AND G. F. KNOWLTON,

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Aphis cryptus n. sp.

This dark green aphid feeds upon the roots or underpart of the crown of match brush, *Gutierrezia longifolia*. Usually the colonies of this tiny aphid are within two inches of the surface of the ground, but individuals have been collected to a depth of four inches.

No parasites have been observed attacking this aphid, but it is attended by the common ant, *Formica rufa*.

This species in some respects resembles the corn root-aphis, *Aphis maidiradicis* Forbes. It can be distinguished from this form by the presence of several secondary sensoria in the apterous form, extending over segments III and IV. *Aphis cryptus* is much smaller, and has heavier cornicles in proportion to its size, than is the case with *Anuraphis gutierrezis*.

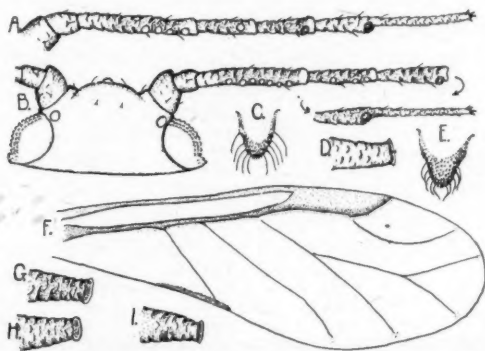


Fig. 1. *Aphis cryptus* n. sp. A, antenna of apterous viviparous; B, head and antenna of alate viviparous; C, cauda of alate; D, cornicle of apterous; E, cauda of apterous; F, front wing of alate; G, cornicle of apterous; H, I, cornicles of alate.

Alate vivipara.—Size, 1.25 mm. long; rostrum long, extending between third coxae; head, thorax and most of antennae and legs black; antennae shorter than the body; antennal III, 0.2 to 0.22 mm. long and armed with 6 to 8 prominent round sensoria in a regular or irregular row; IV, 0.12 to 0.14 mm. with 1 to 3 (usually 1) sensoria; V, 0.11 to 0.13 mm.; VI, 0.08+0.17 to 0.09+0.2 mm.; legs rather short; hind tibia 0.75 mm. long; wings with normal venation, veins dusky brown; abdomen dark green with patches of black on the sides; cornicles black, 0.13 to 0.15 mm. long; cauda black, moderately long, without a constriction near the base; anal plate black end broad.

Described from individuals collected by G. F. Knowlton, between Honeyville and Brigham City, Utah, July 3, 1928.

Apterous vivipara.—Size, 0.95 to 1.2 mm. long; rostrum reaching third coxae; head, antennae and legs mostly dusky to blackish; anterior margin of

1.—Contribution from the Department of Entomology, Utah Agricultural Experiment Station. Publication authorized by Director, December 10, 1928.

head broadly rounded; antennal tubercles undeveloped; antennae shorter than body; antennal III, 0.2 mm. long and armed with about 4 round sensoria on distal part of segment; IV, 0.1 mm., with 1 sensorium; V, 0.1 mm.; VI, 0.09+0.17 mm.; body dark green with dusky areas on sides of abdomen; lateral tubercles prominent; cornicles black, 0.11 to 0.12 mm. long and fairly stout; cauda black, of moderate length, without constriction near base; anal plate black and broadly rounded.

Described from forms collected by Junior author south of Honeyville, Utah, July 3, 1928.

The genus *Anuraphis*, as it is generally used today, is undoubtedly polyphyletic. This group containing such forms as *bakeri* (Cowen), *crataegifoliae* (Fitch), *sensoriata* (Gillette) and *viburnicola* (Gillette) probably constitute a natural group. It is doubtful if the natural unity is maintained when to this group are added such forms as *symphoricarpi* Thomas, *pulvarulens* Gillette, *roseus* Baker, *persicaeniger* Smith, *oregonensis* Wilson and *cardui* Linnaeus. Even the principal character, the short, conical cauda, blends into the genus *Aphis*, in such forms as *maidiradicis* Forbes and *cryptus* n. sp. Consequently, it is an arbitrary matter whether such forms be considered as *Aphis* or *Anuraphis*.

Until a more natural grouping is established it will be convenient to place *aphis*-like forms with short, cone-shaped cauda in the present genus *Anuraphis*.

Anuraphis gutierrezis n. sp.

This yellowish green aphid is occasionally taken, feeding below the surface of the ground, on the crown or root of match brush, *Gutierrezia longifolia*. The colonies of this aphid are usually in depressions in the root, between branches going off at the crown, or in places where the root branches or where it gives off side roots of fair size.

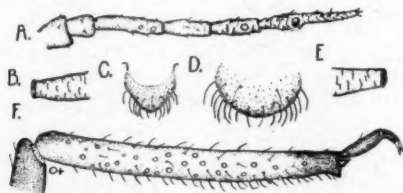


Fig. 2. *Anuraphis gutierrezis* n. sp.—A, antenna; B, cornicle; C, cauda; D, anal plate, of apterous viviparous; E, cornicle; F, hind tibia and tarsus of apterous oviparous.

This aphid is commonly attended by the ant, *Formica rufa*. In the collections made, no parasites or predators were encountered.

The body of this aphid is much larger and lighter colored than *Aphis cryptus*, and the antennae are much shorter in proportion to the body length.

Apterous vivipara.—Color yellowish-green with a slight pruinose covering; length 1.5 to 1.75 mm. long; rostrum long, extending between third coxae; head with vertex broadly rounded; antennal tubercles undeveloped; eyes small, with well-developed tubercles; antennae greenish to dusky, short, hardly half the length of the body; antennal I noticeably thicker than II; III, 0.11 to 0.13 mm. long and armed with 1 or 2 small, round sensoria; IV, 0.1 mm.; V, 0.1 mm.; VI, 0.07

+ 0.09 to 0.09 + 0.11 mm.; prothorax broad with a moderately developed lateral tubercle on each side; abdomen broad; legs short and armed with fine sensilla; hind tibia 0.52 mm. long; cornicles dusky, 0.09 to 0.1 mm. long; cauda dusky, short and broadly conical; anal plate dusky, broadly rounded.

Described from specimens collected at Santaquin, Utah, September 24, 1927, by H. J. Pack, and at Honeyville, Utah, July 3, 1928, by George F. Knowlton.

Type locality, Santaquin, Utah.

Apterous ovipara.—Color yellowish-green; size 1.5 to 1.8 mm. long and very broad; rostrum long, extending between third coxae; antennae less than half the length of the body; antennal III, 0.12 to 0.17 mm. long and usually armed with 1 round sensorium on the distal half of the segment; IV, 0.1 to 0.11 mm.; V, 0.1 to 0.11 mm.; VI, 0.08 + 0.11 to 0.09 + 0.12 mm.; legs short, stout, and armed with numerous fine sensilla; hind tibia 0.53 mm. long and armed with 20 to 35 round sensoria; cornicles dusky, 0.1 mm. long and tapering very slightly toward the distal end; cauda dusky, short, and broadly conical; anal plate dusky and broadly rounded. In general appearance it resembles the apterous vivipara.

Described from specimens collected by Dr. H. J. Pack at Garfield and at Lake Point, Utah, October 8, 1927.

Capitophorus utense n. sp.

This green aphid was collected from the tender apical growth of match brush, *Gutierrezia longifolia*. The body of this species is sparsely set with short, rather fan-like sensilla. In general, it resembles a number of the species of *Capitophorus* feeding on rabbit brush, *Chrysothamnus*, but under the microscope it is easily distinguished from any of the forms so far collected in Utah.

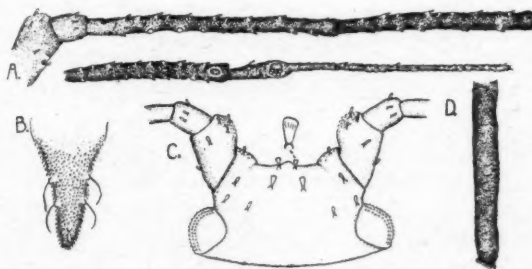


Fig. 3. *Capitophorus utense* n. sp. A, Antenna; B, cauda; C, head; D, cornicle, of apterous viviparous.

Apterous vivipara.—Size 1.4 to 1.9 mm. long, and fairly broad across the abdomen; head with moderately developed antennal tubercles, and armed with a few short fan-like to spoon-like sensilla; antennae about the length of the body, armed with numerous short sensilla, and black, except joint I, and basal portions of II and III, which are dusky; antennal III, 0.45 to 0.5 mm. long, and armed with 2 to 4 round sensoria; IV, 0.32 to 0.4 mm.; V, 0.3 to 0.36 mm.; VI, 0.1 + 0.37 to 0.15 + 0.43 mm.; legs of moderate length; hind tibia 0.9 mm. long; thorax and abdomen armed with but few short, flattened sensilla; cornicles black ex-

cept base, which is dusky, 0.28 to 0.37 mm. long, and in general cylindrical, with a moderate flange; cauda slightly dusky, long and tapering, with usually two lateral hairs on a side and one short, spoon-shaped hair on the dorsal surface; anal plate dusky and somewhat triangular.

The species is described from forms collected by G. F. Knowlton at Loa, Utah, June 26, 1926.

***Tritogenaphis utahensis* n. sp.**

This apple-green to darker green aphid is occasionally found on the apical growth of match brush, *Gutierrezia longifolia*. Ordinarily not more than one or two individuals have been collected on a single plant, but at Deweyville, Utah, on September 13, 1927, a number of winged and wingless females were present on one twig.

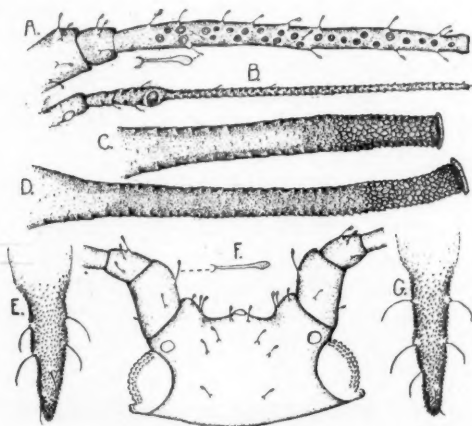


Fig. 4. *Tritogenaphis utahensis* n. sp. A, B third and sixth antennals of alate viviparous; C, cornicle of apterous viviparous; D, cornicle of alate; E, cauda of alate; F, head of alate; G, cauda of apterous.

Alate vivipara.—Size, 1.8 to 2.1 mm. long; rostrum barely reaching third coxae; antennal tubercles well-developed; ocular tubercles prominent; antennae longer than the body and dark beyond a basal portion of III; body and appendages armed with prominent hairs, enlarged or flattened at the apex; antennal III, 0.67 to 0.7 mm. long and armed with about 25 to 30 round sensoria of various sizes; IV, 0.5 to 0.57 mm.; V, 0.39 to 0.48 mm.; VI, 0.11 + 0.6 to 0.11 + 0.7 mm.; legs long, slender and black beyond middle of the femur; hind tibia 1.5 to 1.7 mm. long; wings with normal venation, veins brownish and slender; abdomen moderately broad; cornicles black beyond basal one-fifth, which is dusky, 0.79 to 0.83 mm. long and with closed reticulations over the apical one-fifth of the surface; cauda dusky, tapering, elongate, usually with two lateral hairs on each side and two on the distal, dorsal surface; and plate dusky, rounded.

Described from forms collected by junior author in Utah from Honeyville, September 3, 1927; Logan, September 11, 1927, and Deweyville, September 13, 1927.

Apterous vivipara.—Size, 1.5 to 2 mm. long; body and appendages covered with prominent hairs as in the winged forms; antennae longer than body and situated on prominent tubercles; antennae III, 0.52 to 0.58 mm. long and armed with about 25 round sensoria of various sizes; IV, 0.34 mm.; V, 0.3 mm.; VI with base 0.1 mm. long (filaments broken on apterous specimens); cornicles with apical half black and dusky at base, with closed reticulations over nearly one-fourth of the distal surface; cauda somewhat dusky, elongate, with two lateral hairs on each side, and two on the dorsal surface toward distal end; anal plate dusky and broadly rounded.

Described from specimens collected by G. F. Knowlton at Deweyville, Utah, September 13, 1927.

In many respects this aphid resembles *Tritogenaphis escalantii* Knowlton. From this species it differs particularly in having shorter cornicles, with only about the distal one-fifth covered with closed reticulations, while *escalandtii* has this reticulation over almost the distal third. The antennal segments are shorter, and the number of sensoria on III are less than in *escalandtii*.

***Tritogenaphis gutierrezia* n. sp.**

This shiny, bright green aphid has occasionally been collected on leaves or tip growth of match brush, *Gutierrezia longifolia*.

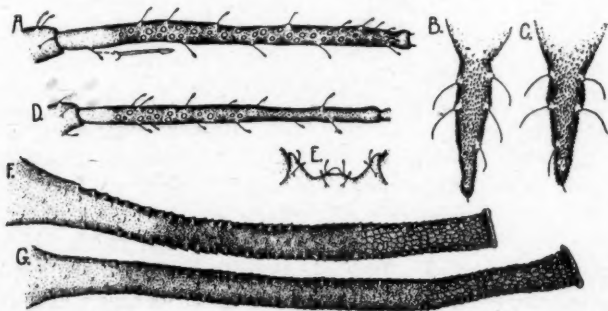


Fig. 5. *Tritogenaphis gutierrezia* n. sp. A, antennal III of alate viviparous; B, cauda of alate; C, cauda of apterous viviparous; D, antennal III of apterous; E, anterior margin of head of alate; F, cornicle of apterous; G, cornicle of alate.

Alate vivipara.—Size, 1.9 to 2.2 mm. long; rostrum extending through second coxae; antennal tubercles prominent; antennae longer than the body and black beyond base of III; antennal III, 0.62 to 0.7 mm. long and armed with 25 to 35 round sensoria; IV, 0.53 mm.; V, 0.45 mm.; VI, 0.15 + 0.67 mm.; wings with normal venation; veins slender; legs long; cornicles black beyond a basal dusky portion, 0.9 to 1.1 mm. long, with closed reticulations covering approximately the distal one-fourth of the surface; cauda elongate, greenish, with two or three lateral hairs one each side and one or two on dorsal surface, nearer apex; anal plate dusky and broadly rounded.

Described from winged forms collected by G. F. Knowlton at Loa and Torrey, Utah, June 26, 1926, and at Emery, Utah, June 28, 1927. Type is the alate form.

Apterous vivipara.—Size, 2 mm. long; rostrum extending between third coxae; head with prominent antennal tubercles and armed with rather long, apically flattened sensilla; antenna longer than body, and dusky to black beyond base of III; antennal III, 0.58 mm. long and armed with 12 to 18 round sensoria; IV, 0.4 mm. long; V, 0.35 mm.; VI, 0.11 + 0.65 mm.; abdomen somewhat pear-shaped; cornicles dusky to black, darker toward apex, 0.95 mm. long and with closed reticulations over approximately the apical fourth of the surface; cauda green to dusky, elongate tapering, with two or three lateral hairs on each side and one or two on dorsal surface toward distal end; anal plate dusky, broadly rounded.

Described from wingless females collected at Kanab, Utah, June 26, 1927. This appears to be same species as the alate forms, but no apterous and alates have been taken in the same collection.

This aphid differs from *Tritogenaphis utahensis* in having noticeably longer cornicles, which are covered for about the distal fourth of their length with closed reticulations.

Types in the collection of the junior author. Cotypes and paratypes in the collections of the U. S. National Museum and Utah Agricultural Experiment Station.

STUDIES IN THE SCARABAEIDAE (III.)*

BY W. J. BROWN,
Ottawa, Ont.

Onthophagus medorensis n. sp.

Onthophagus guatemalensis Schaeffer (nec Bates), Jour. N. Y. Ent. Soc., XXII, 295, 1914.

Length 4.5-7 mm.; width 2.8-4 mm. Broadly oval; moderately convex; feebly shining; blackish, the dorsum with a bluish or greenish tint; body with erect brownish hairs. Head about one-half as wide as prothorax; genae moderately arcuate.

Pronotum three-fourths as long as wide, widest at middle; the base without an impressed marginal line. Disk alutaceous; granulate, the granules rather sparse, shining, rounded in form, each supporting at its base a long erect hair.

Elytra slightly wider than the pronotum, the suture and pronotum equal in length, the sides moderately arcuate. Striae fine, with well spaced, fine punctures. Intervals finely alutaceous; the sutural with a single row, the others with two rows of very small rounded, shining granules; a rather long, erect hair arising behind each granule.

Pygidium alutaceous in basal half, shining apically, coarsely and rather closely punctate throughout. Metasternum and femora coarsely, rather sparsely punctate.

Male.—Head rather coarsely, sparsely punctate, with traces of rugae at the side of the clypeus. Clypeus rectangular, the apical angles broadly rounded, the anterior margin at middle produced into a broad, triangular, reflexed process which is rather broadly rounded at apex. Clypeal carina distinct; carina of vertex obsolete at middle, produced on each side into a strong, acute tubercle. Pronotum without sculpture near anterior margin, the declivity almost vertical; pronotum

*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept. of Agric., Ottawa.

tal process about one-third as wide as pronotum, as long as wide in well-developed individuals, becoming slightly wider toward apex, the apex moderately deeply emarginate. Anterior tibia elongate, arcuate, the inner apical angle acutely produced and without a pencil of hairs.

Female.—Head coarsely, rather closely punctate, the clypeus strongly rugose. Clypeus semicircular; the margin evenly reflexed, feebly truncate at apex. Both carinae very strong, that of the vertex not feeble at middle and not produced into tubercles. Pronotal declivity less strong, the process very short, not emarginate. Anterior tibia shorter, less arcuate, the inner apical angle not produced, the spur longer.

Holotype.—♂, Payne Co., Oklahoma, March 22, 1925, (W. J. Brown); No. 2971 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data.

Paratypes.—96, same data as holotype, March 15 to October 25. KANSAS: 15, Medora, May 17 and 27 and August 28, (Knaus and Brown). TEXAS: 3, Colorado Co., (Grace Wiley); 2, Axtell, Tex., April 10, 1904; 14, Dallas (Boll); 3, Paige; 1, Waco, June 10, 1904.

This is the species recorded by Mr. Schaeffer as *guatemalensis* Bates. The two species are closely allied, but in *guatemalensis* the granules of the pronotum and elytral intervals are very small and very sparse, much more so than in *medorensis*.

Recognition of the present species was made possible by the kindness of Mr. A. Boucomont from whom I have received four specimens of *guatemalensis*. I have seen three other specimens collected by Champion at San Joaquin Vera Paz and Capetillo, Guatemala.

***Aphodius pyriformis* n. sp.**

Length 5.6-7 mm.; width 2.7-3.3 mm. Moderately elongate, strongly convex. Black, the underside and legs dark brown; shining.

Head four-fifths as wide as the prothorax; front and posterior fifth of clypeus finely, rather closely punctate; frontal suture evident, without tuberosities; clypeus with short, close, transverse rugae which extend almost to frontal suture. Clypeal margin broadly and feebly emarginate; on each side of emargination very broadly rounded and with two small acute denticles; the inner denticle spiniform, situated well within the emargination; outer denticle shorter but very acute, situated at the extremity of the emargination; side margins of clypeus moderately arcuate. Genae subacute, moderately prominent.

Pronotum two-thirds as long as wide; widest in front of middle and strongly narrowed basally; the side margins strongly arcuate, oblique near the elytral humeri; the hind angles obliterated; basal margin feebly arcuate, with marginal line at middle only. Disc closely punctate; the punctures not closer on the sides, consisting of fine and moderately coarse punctures intermixed; the coarse punctures less numerous at middle, especially near the anterior margin.

Elytra oval, much narrower than the pronotum, strongly convex, distinctly inflated; three-fourths as wide as long, widest at middle; sides strongly arcuate, converging rather strongly to base; humeri very finely dentate; base feebly emarginate. Disc sharply striate; the striae very finely and indistinctly, not closely punctate; the intervals moderately convex, finely and sparsely punctate.

Mesosternum densely punctate, the intercoxal process obtusely carinate. Metasternum finely, sparsely punctate. Abdomen alutaceous, impunctate at middle, finely punctate on the sides. Anterior tibia tridentate, the margin entire above the upper tooth; the spur stout, curved inwardly before the apex which is very acute. Middle and hind femora finely and sparsely punctate, their tibiae fimbriate with short, equal spinules. First segment of hind tarsus slightly longer than the two following. Sexual characters not apparent.

Holotype.—Esmeralda Co., Nev., March 5, 1908, (F. W. Nunemacher); No. 2950 in the Canadian National Collection, Ottawa.

Paratypes.—7, same data, on various dates in February, March and June, 1908; 1, Cal.

This is the only species in the groups having the prothorax distinctly narrowed toward the base in which the clypeal margin bears four denticles. It traces to *nevadensis* or *martini* in the tables but differs from these in the above character and in having the elytra more convex and oval and the pronotum with many more coarse punctures. The clypeal denticles are reduced in the older, worn specimens. The paratype from California is evidently immature, being dark reddish brown in color.

***Aphodius corraptor* n. sp.**

Length 6.2-7.5 mm.; width 2.7-3.5 mm. Moderately elongate and convex, parallel. Black; the elytra, legs, abdomen, pronotum near lateral margin usually, clypeal margin rarely, reddish-yellow; polished.

Head two-thirds as wide as pronotum; rather coarsely and closely punctate, sparsely and finely so at middle; frontal suture evident, with three feeble tuberosities. Clypeus rather broadly, not deeply emarginate, distinctly and obtusely angulate on each side of the emargination, these angles and the lateral clypeal margins narrowly reflexed, the latter oblique. Genae very broadly rounded, moderately prominent.

Pronotum slightly more than two thirds as long as wide, widest near base; the sides feebly arcuate, rather widely and strongly explanate; base sinuate each side of middle, with a fine entire marginal line; angles very broadly rounded, the hind angles very obtuse and not well defined. Disc with fine and moderately coarse punctures, the latter confined to basal half and the lateral declivities; puncturation close on the sides, less close but not sparse at middle.

Elytra parallel, polished and without trace of alutaceous sculpture; finely striate, the striae with fine close punctures; intervals feebly convex, very finely and sparsely punctate.

Mesosternum strongly alutaceous, the intercoxal process with or without a carina. Metasternum rather finely punctate, alutaceous on the sides. Abdomen alutaceous, finely and closely punctate. Anterior tibia strongly tridentate, the margin crenate or not above the upper tooth. Middle and hind femora finely and sparsely punctate, their tibiae fimbriate at the apices with long, unequal spinules. First segment of hind tarsus as long as the two and one-half following.

Male.—Anterior tibial spur very stout, parallel, slightly wider near the apex which is suddenly incurved and bluntly pointed. Minor spur of middle tibiae about half as long as the major, stout, strongly curved, narrowed toward the apex which is twisted and squarely truncate.

Female.—Anterior tibial spur slender, shorter, narrowed to the apex which is very acute. Minor spur of middle tibia more than half as long as the major, slender and straight, the apex very acute.

Holotype.—♂, Calgary, Alta., May 29, 1924, (O. Bryant); No. 2949 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data, May 12, 1924.

Paratypes.—2♂, 5♀, same data as holotype; 1♀, Medicine Hat, Alta., April 21, 1924, (F. S. Carr); 1♀, Empress, Alta., May 3, 1923, (F. S. Carr); 1♀, Olds, Alta., (T. N. Willing); 1♂, Cowley, Alta., Sept., 1918, (R. N. Chrystal); 1♀, Banff, Alta., July 1, 1928, (O. Bryant), from burrow of Franklin's spermophile; 1♂, 2♀, Aweme, Man., May 27, 1921 and June 24, 1924, (E. and N. Criddle); 1♂, Moose Jaw, Sask.; 1♂, Nelson, B. C., Aug. 20, 1907, (J. Fletcher).

This species is closely allied to *explanatus* and was confused by me with the latter in my paper on the subgenus *Platyderides* (Can. Ent., LX, 13). In *explanatus*, the pronotal sides are more strongly explanate; the punctures of the elytral intervals are coarser; and the pronotum and elytra have a microscopic alutaceous sculpture which causes the insect to appear a bit dull. In the present species, the dorsum is highly polished and without a trace of such sculpture. In *explanatus*, the lateral lobes of the genitalia are bent less strongly than in *corruptor*. Of *explanatus*, I have seen the type and another female from Colorado and two males from Garland and Creede, Colorado; these specimens agree in the characters noted above.

***Aphodius anomaliceps* n. sp.**

Length 5.3-5.8 mm.; width 2.3-2.6 mm. Elongate, subparallel, moderately convex. Pale reddish brown throughout, shining.

Head two-thirds as wide as pronotum; moderately coarsely and closely punctate; frontal suture evident, with three feeble transverse tuberosities. Clypeus feebly and broadly tumid at middle; the anterior margin at middle with a rather narrow, moderately deep emargination, the side margins fimbriate with short yellow hairs, strongly and rather broadly reflexed, and moderately arcuate; this reflexed margin giving rise to a small, obtuse, but very distinct tooth at each end of the emargination. Genae broadly rounded; their margins not continuous with those of the clypeus, the genae therefore quite prominent.

Pronotum strongly convex; seven-tenths as long as wide; the sides subparallel in basal half, strongly converging apically; basal margin feebly and regularly arcuate at middle, becoming slightly but distinctly oblique before the hind angles; with strong, entire marginal line; the hind angles rounded and very obtuse. Disc moderately closely punctate, the punctures coarse and somewhat unequal, scarcely closer on the sides; the median line narrowly impunctate except near apex.

Elytra subparallel; finely striate, the striae with fine, moderately close punctures; the intervals feebly convex, finely and very sparsely punctate, the punctures almost as large as those of the striae.

Mesosternum strongly alutaceous, the intercoxal process not carinate. Metasternum sparsely punctate, the punctures fine at middle, coarse on the sides. Abdomen microscopically alutaceous, with a few very fine punctures. Anterior tibiae of normal form; very strongly tridentate, the margin feebly crenate above

the upper tooth. Middle and hind femora finely and sparsely punctate. Middle and hind tibiae with very strong transverse ridges, fimbriate at their apices with long unequal spinules. First segment of hind tarsus equal in length to the two following.

Male.—Median cephalic tubercle distinct. Anterior tibial spur stout, parallel, the apex suddenly curved inwardly, acute. Minor spur of middle tibia half as long as the major, not narrowed apically, slightly twisted before the apex which is blunt; the inner apical angle slightly produced, acute.

Female.—Median cephalic tubercle obsolete. Anterior tibial spur moderately slender, gradually narrowed to the apex which is acute. Minor spur of middle tibia as in the male but narrowed before the apex which is acute.

Holotype.—♂, Estancia, N. M., Aug. 25, 1925, (C. H. Martin); No. 2948 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data.

Paratypes.—4 ♂, same data.

This species is allied to *aemulus* and *rubiginosus*. It is readily distinguishable from these and other allies by the form of the head and the very short first segment of the posterior tarsus.

***Aphodius dentigerulus* n. sp.**

Length 4.5-5.6 mm.; width 2.1-2.9 mm. Moderately elongate and convex; slightly wider posteriorly; black and shining throughout.

Head two-thirds as wide as the pronotum; regularly punctate, the punctures moderately coarse and close, less close on the front. Clypeus with a broad, low tumidity at middle, moderately declivous in front and flattened on each side; the anterior margin broadly and feebly emarginate, a small subacute tooth on each side just within the emargination, a strongly elevated angulate line forming a small triangle with the apical margin at middle of emargination; the lateral clypeal margin scarcely arcuate, closely fimbriate with rather short, brownish hairs; frontal suture evident, without tubercles. Genae obtuse, fimbriate, moderately prominent.

Pronotum slightly more than two-thirds as long as wide, widest at base; the side margins fimbriate near the anterior angles, moderately converging apically, scarcely arcuate; all angles obtuse, broadly rounded; base feebly but distinctly sinuate on each side of middle, with a very distinct marginal line. Pronotal puncturation consisting of intermixed fine and moderately coarse punctures, these sparse, not closer on the sides, the median line narrowly impunctate in basal half.

Elytra at base as wide as the prothorax, very slightly wider posteriorly. Elytral disc finely striate, the striae with fine, moderately close punctures; the intervals almost flat, very finely and sparsely but distinctly punctured.

Mesosternum strongly alutaceous, substrigate at middle, the intercoxal process not carinate. Metasternum with coarse sparse punctures, impunctate at middle and in front of the coxae, an arcuate row of punctures extending from the middle coxae to the posterior coxae on each side. Abdomen alutaceous; sparsely, finely and indistinctly punctured. Anterior tibiae strongly tridentate, the margin crenate above the upper tooth. Middle and hind femora finely and sparsely punctate.

tate. Middle and hind tibiae with very strong transverse ridges, fimbriate at their apices with long unequal spinules. First segment of hind tarsus equal in length to the two following.

Male.—Anterior tibial spur moderately stout, the inner margin straight. Minor spur of middle tibia less than half as long as the major, stout, scarcely narrowed but not dilated apically, the apex almost squarely truncate, the inner apical angle slightly produced.

Female.—Anterior tibial spur very slightly more slender than that of male. Minor spur of middle tibia about half as long as the major, slender, acutely pointed at apex.

Holotype.—♂, 101 Ranch, Noble Co., Okla., June 29, 1926, (W. J. Brown); No. 2946 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data.

Paratypes.—26 ♂, 60 ♀, 101 Ranch and Otoe Pasture, Noble Co., Okla., June 21, 28 and 29, 1926, (W. J. Brown).

This species is closely allied only to *dentiger*. The latter is more robust and larger, measuring from 5.8 to 6.1 mm.; has the clypeus arcuate on each side and much more strongly declivous before the median tumidity; and the middle and hind femora are more coarsely and less sparsely punctate. In the male of *dentiger*, the anterior spur is very distinctly curved inwardly at the apex, and the minor spur of the middle tibia is dilated at the apex which is not simply truncate but very distinctly emarginate.

The present species occurs in the burrows of the common prairie dog.

***Aphodius snowi* n. sp.**

Aphodius cruentatus auct. nec Leconte.

Length 5.2-7 mm.; width 2.5-3.3 mm. Moderately elongate and convex; slightly wider posteriorly; blackish, the elytra and legs varying from rather pale to dark reddish brown; shining.

Head from three-fifths to two-thirds as wide as pronotum; front rather finely and sparsely punctate; frontal suture evident, usually with three very feeble tuberosities. Clypeus rather closely punctate with unequal punctures; the anterior margin broadly and very feebly emarginate, very broadly rounded on each side of emargination, the sides scarcely arcuate. Genae very broadly rounded, not prominent.

Pronotum seven-tenths as long as wide; the angles obtuse and broadly rounded; the base feebly sinuate on each side of middle, with a strong marginal line. Pronotal puncturation consisting of fine and moderately coarse punctures intermixed, differing in the sexes, close on the sides.

Elytra at base almost as wide as pronotum, slightly wider posteriorly. Striae fine, with well separated, fine punctures. Intervals feebly but distinctly convex, microscopically alutaceous, each with a very irregular row of fine punctures on each side near the striae, these punctures coarser than usual.

Mesosternum strongly alutaceous, substrigate at middle, the intercoxal process not carinate. Metasternum finely and sparsely punctate at middle, coarsely and more closely so on the sides. Abdomen strongly alutaceous, closely and coarsely punctate. Anterior tibiae strongly tridentate, the margin above the

upper tooth crenate. Middle and hind femora finely and sparsely punctate, each with a short row of coarse punctures near apex. Middle and hind tibiae with strong transverse ridges, each fimbriate at apex with long, unequal spinules. First segment of hind tarsus equal in length to the three following.

Male.—Median cephalic tubercle distinct. Pronotum larger, not narrowed apically, the side margins more strongly arcuate, the disc with the punctures sparse at middle; the smaller males similar to the females in pronotal characters. Anterior tibial spur stout, acute at apex, feebly curved caudad. Minor spur of middle tibia less than half as long as the major, moderately stout, the apex obliquely truncate; the inner apical angle slightly produced. Middle and hind trochanters and an area on middle femur adjacent to the trochanter with long, dense, yellow hairs. Apex of last ventral segment impressed at middle.

Female.—Median cephalic tubercle obsolete. Pronotum smaller, narrower at apex than at base; the side margins less strongly arcuate; the disc rather closely punctate throughout. Anterior tibial spur as in the male but more slender. Minor spur of middle tibia about half as long as the major, more slender, the apex acute. Middle and hind trochanters and femora with a few scattered hairs. Last ventral segment not impressed.

Holotype.—♂, S. Arizona, Aug. 1902, (F. H. Snow); No. 2947 in the Canadian National Collection, Ottawa.

Allotype.—♀, same data.

Paratype.—4♂, 10♀, same data as holotype; 1♂, Humphrey's Peak, Ariz., (F. H. Snow); 3♀, New Mexico, (F. H. Snow); 2♀, Santa Fe Canon, N. M., Aug. 1880, (F. H. Snow); 2♂, 3♀, Cloudcroft, N. M., July 8, 1917 and Aug. 5, 1918, (Wheeler and Knaus); 1♂, Magdalena, N. M.; 3♂, 1♀, Ouray, Colo., (H. F. Wickham).

This species was misidentified by Horn as *cruentatus* Lec. Subsequent workers have followed Horn in this error. It is most closely allied to *fimbripes* and *albertanus* and may be separated from these by characters noted in their descriptions. It is frequently confused with members of the *aleutus-anthracinus* complex.

Aphodius cruentatus Lec. is a member of the subgenus *Platyderides*. It is closely allied to *phacopterus* and *haywardi*, differing from the former in pronotal sculpture and from the latter by its more strongly explanate pronotal margins.

Dialytes criddlei n. sp.

Length 3.5-4 mm. Oblong; slightly broader behind; black; subopaque. Clypeus broadly, not deeply emarginate; a very obtuse, slightly reflexed tooth on each side of emargination; the sides oblique to genae; genae broadly rounded. Vertex rather coarsely, densely punctate; head elsewhere very indistinctly punctate, the punctures sparse and fine at middle, coarser and less sparse on the sides.

Pronotum three-fourths as long as wide, the side margins parallel in basal half, then converging slightly to apex; apical angles rectangular; base arcuate at middle, strongly oblique and slightly sinuate on each side, the basal angles obtuse, the marginal line distinct. Median line broadly, rather deeply impressed; disk coarsely punctate, the punctures separated on each side of median impression, cribrate elsewhere, becoming shallow on the sides.

Elytra feebly emarginate at base, widest near middle, the sides moderately arcuate; humeri dentate. Elytral intervals strongly costiform, the third, fifth and seventh often less strongly elevated than the others; the striae limited on each side by a very carinule, the carinules interrupted by the distant strial punctures.

Mesosternum rather coarsely, cribrately punctate, the median carina obsolete. Metasternum rather coarsely punctate, the punctures close at middle, less close on the sides. Middle and hind femora less coarsely punctate, the punctures moderately close and rather indistinct. Abdomen alutaceous, indistinctly punctate. First segment of posterior tarsus longer than the three following together.

Holotype.—Aweme, Manitoba, June 4, 1927, (N. Criddle); No. 2652 in the Canadian National Collection, Ottawa.

Paratypes.—13, Aweme, Manitoba, June 2 and 4, 1927, (N. Criddle); 1, Wawanesa, Manitoba, September 22, 1922, (R. M. White).

This species is similar to *striatulus* in size but is closely allied only to *ulkei* which it approaches in pronotal and elytral form and sculpture. In the latter, the clypeus bears an acute tooth on each side of the emargination and, like the front, is coarsely punctate. In *ulkei* also, the elytral costae are less elevated and less convex, and the carinules on each side of the striae are much larger and are not interrupted by the strial punctures except at the sides.

Dialytellus n. gen.

Facies of *Dialytes*. Strongly convex. Head very wide but not as wide as the pronotum, feebly convex, strongly deflexed, without tubercles and carinae; eyes concealed in repose; clypeus simply emarginate.

Pronotum strongly and simply convex; truncate in front; the side margins subparallel, not explanate, not fimbriate; the disc without costae or impressions; the hind angles obliquely truncate and feebly emarginate; base with a strong marginal line.

Elytra simply punctato-striate; at base almost as wide as the pronotum; the sides arcuate, the base feebly emarginate and without marginal line; the humeri strongly dentate; the epipleurae normal.

Ventral sclerites, and coxae, normal, the latter not arcuate or notably slender. Mesosternum not carinate. Anterior femora without a strongly arcuate, lamelliform margin; the tibiae rather strongly tridentate externally; obliquely truncate at apex. Middle and hind tibiae straight, slender, gradually and very feebly widened toward apices, each with two feeble traces of transverse carinae. Tarsi and their claws normal.

Type. *Aphodius humeralis* Lec.

This genus is a member of the tribe *Eupariini*. It is closely allied to *Dialytes*; except for those of the head and anterior legs, its characters are exactly as in the latter. The simple anterior femur, tridentate anterior tibiae, and large head are essentially as in *Ataenius* except that the head is less convex than in the latter.

Besides the type species, *Dialytellus* includes *Aphodius dialytoides* Fall. I have seen the type and another specimen of *humeralis* and a cotype of *dialytoides* from Mt. Watatic, Mass., which is here designated the lectotype. The following brief characterizations are drawn from this material.

Head finely alutaceous, with a few fine, indistinct punctures near base; pronotum not alutaceous, highly polished, the punctures coarse and very sparse, a broad median area in apical half impunctate; elytral striae slightly finer, the intervals wider. Anterior tibial spur of male slender, gradually narrowed, the apex acute and strongly curved inwardly, the spur straight and simple in the female. Length 3.6 mm. Detroit, Mich. and Chatham, Ont.

..... *humeralis* Lec.
Head closely and rather coarsely punctate, the punctures sparse and smaller on a small median area; pronotum punctate throughout, coarsely and very densely so on the lateral declivities, the punctures irregular at middle, close at the base, less coarse and sparse near apex; elytral striae coarser, the intervals less wide. Anterior tibial spur of male stouter, the apex squarely truncate and almost as wide as the base, the margin of the inner side deeply and arcuately emarginate near apex; female unknown. Length 3.4 mm. Highlands, N. C. and Mt. Watatic, Mass. *dialytoides* Fall.

***Acoma arizonica* n. sp.**

Length 4.7-7 mm.; width 2-3 mm.; elongate and parallel, moderately convex, very pale reddish-brown throughout; head and prothorax glabrous but fimbriate at the sides with close, long hairs; elytra clothed with sparse, inconspicuous hairs, the margins fimbriate with close, long hairs; under surface with long, sparse hairs.

Occiput impunctate; the front coarsely, very densely and deeply rugoso-punctate; clypeus coarsely and sparsely punctate, the margin very broadly reflexed and feebly emarginate at apex as usual. Antennal club composed of three lamellae.

Pronotum seven-tenths as long as wide; the lateral margins straight and oblique behind the acute front angles, strongly rounded at middle and thence straight and feebly converging to base; basal angles very broadly rounded, obsolete; basal margin very feebly arcuate. Disk not coarsely, very sparsely punctured, the punctures wanting near the basal margin and in a broad median line.

Elytra very slightly wider than the pronotum, widest at middle; striae well defined except on the sides, with feebly impressed, fine punctures; intervals each with a single irregular row of punctures as coarse or coarser than those of the pronotum and less closely placed than those of the striae, those of the sides somewhat rugose.

Under surface with a few coarse punctures, clothed with moderately long, not dense hairs.

Holotype.—♂, Prima Co., Ariz., Sept. 1, 1925, (C. L. Marsh); No. 2953 in the Canadian National Collection, Ottawa.

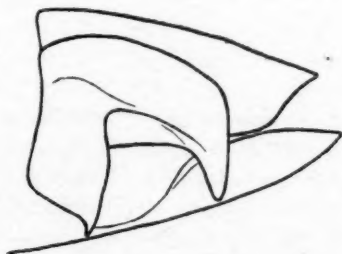
Paratypes.—9 ♂, Phoenix, Ariz., Aug. 2-7, 1917, (Cornell U. Biol. Exp.); 7 ♂, Walton, Ariz., Aug. 9, 1917, (Cornell U. Biol. Exp.); 5 ♂, Temple, Ariz., Aug. 1, 1917, (Cornell U. Biol. Exp.); 1 ♂, Tucson, Ariz., July 25, 1925, (R. B. Streets); 23 ♂, San Xavier near Tucson, Ariz., July 24, 1916; 1 ♂, Calexico, Cal., Aug. 11, 1914, (J. C. Bradley).

This is probably the species considered *brunnea* Csy. by Dr. Van Dyke in his review of the genus (Pan-Pac. Ent., iv, 159). The true *brunnea* is represented in the collection at hand by a single specimen from the Cornell University Col-

lection taken at Lordsburg, New Mexico. It is characterized by its dark reddish brown color and by the long, conspicuous hairs of the elytra and undersurface. In *brunnea*, the hairs of the elytra are much longer than the width of any interval; in *arizonica* these hairs are not longer than the width of the widest intervals. There is, however, some variation in the length of the elytral hairs in both species, as Mr. L. L. Buchanan has informed me that the hairs vary somewhat in length in the three Casey specimens of *brunnea* which were compared by him with the specimen of *brunnea* noted above and with specimens of *arizonica*. In some specimens of *arizonica*, the anterior clypeal margin is simply truncate or broadly and evenly rounded; this condition appears to result from the wearing away of the clypeal margin. Paratypes are deposited in the collection of the American Museum of Natural History and Cornell University.

***Bolbocerosoma hamatum* n. sp.**

Length 10 mm.; width 7.6 mm. Sanford's brown in color, the dorsum marked as follows: head except clypeus and trophi, tubercles and limiting concavities of pronotal carina, anterior margin of pronotum in front of the carina, pronotal base between the elytral humeri, scutellum, extreme base of elytra except the humeri, sutural intervals, an area on each elytron extending from humerus and sutural interval at basal fourth to apex but not including the apical umbone, black; venter and legs yellow; outer margins of tibiae narrowly blackish.



B. hamatum n. sp.

Fine secondary puncturation of pronotum very indistinct; the pronotal disk with a broad, rather feeble but distinct depression on each side midway between the pronotal modification and humeral umbone of elytra. Second elytral stria obliterated, represented at base by four or five fine and very feeble punctures. Fifth and eighth striae obliterated, each represented by a row of fine and very feeble punctures; the five well developed striae between suture and humeral umbone deep and coarsely punctured, the punctures without hairs.

* Mesosternal prominence between the middle coxae acute, not elevated above the plane of the metasternum. Hairs of underside not dense. Anterior tibia with nine external teeth.

Male.—Punctures of clypeus close, moderately coarse and feebly impressed; punctures of front and vertex very fine, sparse, and indistinct. Pronotum at middle coarsely, not closely, irregularly punctate; the punctures of the sides

finer, dense and very feebly impressed; coarse punctures of the declivity sparse and confined to apical half. Pronotal modification feeble; the carina scarcely emarginate but strongly arcuate, the tubercle at each end rectangular when in dorsal aspect. Genital capsule as figured.

Holotype.—♂, Billy's Island, Okefenoke Swamp, Georgia, in the collection of Cornell University.

This species is allied to *lepidissimum* and *farctum* but differs from these and all of the other species in the form of the lateral lobes of the genital capsule; in no other species are these lobes deflexed at their apices to form hooks. In the total obliteration of the second, fifth, and eighth elytral striae, *hamatum* resembles *lepidissimum*. The pronotal puncturation of the present species approaches that of *farctum*, but in neither of the allied species are the lateral pronotal and clypeal punctures as feebly impressed as in *hamatum*. The pronotal depressions, if they are constant, will separate *hamatum* from all of our other species.

LABOPS VERAЕ, NEW SPECIES, WITH LABOPELLA, NICHOLIA,
AND PRONOTOCREPIS, NEW GENERA OF NORTH AMERICAN
MIRIDAE (HEMIPTERA).

BY HARRY H. KNIGHT,

Ames, Iowa.

Labops verae n. sp.

Distinguished from allied species by the relatively narrow head and smaller eyes; width of head across eyes about equal to basal-width of pronotum; length of second antennal segment much greater than width of head.

♂. Length 3 mm., width 1.55 mm. Head: width 1.09 mm., vertex .70 mm.; width of eyes greater than the transverse diameter, nearly round, prominent but not pedunculate; base of vertex with an arcuate elevated ridge from eye to eye, the posterior slope of this ridge pale except on median line; juga normal, not swollen. Rostrum, length 1.39 mm., reaching upon third ventral segment, rather thick, black. Antennae: segment I, length .49 mm., thickness .15 mm., constricted at base; II, 1.51 mm., greatest thickness .12 mm. near apex, tapering to slender at base; III, .59 mm., slender; IV, .67 mm.; black, clothed with short pubescence. Pronotum: length .53 mm., width at base 1.06 mm.; calli defined in front by an impressed line. Hemelytra short, leaving the last four abdominal segments exposed. Clothed with short, sparsely set, yellowish hairs, and intermixed with prostrate, deciduous, silvery white scales.

Color black, embolium and more broadly at apex, basal half of corium to within radial vein, posterior slope of ridge on vertex except on middle, spot beneath eye, narrow ventral margin of propleura, tips of coxae and transverse mark near base, and margins of ostiolar peritreme, pale; middle and hind tibiae yellowish to brownish on dorsal aspect. Genital claspers distinctive, right clasper much as in *hirtus* Kngt., but with the lower distal angle produced as an incurved, blunt, acuminate hook.

♀. Length 3.4 mm., width 1.9 mm. Head: width 1.14 mm., vertex .71 mm. Antennae: segment I, length .50 mm.; II, 1.45 mm.; III .59 mm.; IV,

.71 mm. Pronotum: length .55 mm., width at base 1.11 mm. Hemelytra, pubescence and coloration very similar to the male.

Holotype: ♂ August 9, 1928, Van Trump Park, alt. 6000 ft., Mt. Rainier, Washington (Mrs. Vera G. Davidson); author's collection.

Allotype: same data as the type.

Paratypes: 2 ♀, taken with the types. ♂ July 4, 3 ♂ 1 ♀ July 20, ♀ July 21, 1925, Banff, Alberta (Owen Bryant). Named in honor of Mrs. Vera G. Davidson who collected and presented the first specimens seen by the writer.

Labopella new genus.

Arolia erect and converging at apices as in subfamily Orthotylinæ; the broad head and large eyes indicate a relationship with *Labops* Burm. of the tribe Labopini, but eyes broader at base and more oval as viewed from the side. Frons broad, tumid near tylus, basal edge of vertex elevated into a carina, forming an arcuate line in continuation with posterior margins of the eyes. Tylus strongly arcuate as viewed from the side. Rostrum moderately slender, scarcely attaining hind margins of middle coxae. Calli prominent, front margins coincident with anterior margin of pronotum, smooth; pronotal disk and propleura rugulose punctate, lateral margins straight, anterior angles in close contact with and obscured by the eyes, basal margin transverse on middle third. Scutellum triangular, moderately convex, finely pubescent but not distinctly punctate; mesoscutum moderately exposed. Hemelytra fully developed, texture translucent, embolar margins nearly straight, cuneus moderately deflexed, areoles and membrane normal. Legs moderately slender. Antennae slender, length of first segment not equal to diameter of an eye. Genotype: *Labopella claripennis* n. sp.

Labopella claripennis n. sp.

♀. Length 3 mm., width 1.44 mm. Head: width 1.03 mm., vertex .46 mm.; basal carina set with bristles, vertex slightly sulcate on middle, finely pubescent; yellowish to orange red, frons, tylus, juga, and surrounding base of antennae, fuscous to black. Rostrum, length .92 mm., almost attaining hind margins of middle coxae, segment I reaching upon middle of xyphus, orange yellow, apex fuscous. Antennae: segment I, length .18 mm., not equal to diameter of an eye, reddish brown to dusky; II, broken, evidently slender. Pronotum: length .50 mm., width at base .98 mm.; calli strongly convex, smooth; disk evenly rugulose punctate. Scutellum moderately convex, smooth, pubescent; mesoscutum moderately exposed.

Dorsum clothed with rather fine fuscous pubescence. Thorax and legs yellowish to deep orange, legs and sternum more orange red, tibiae paler, tarsi fuscous apically; meta-pleura and venter greenish, genital segments becoming yellowish. Hemelytra uniformly pale translucent, membrane and veins pale, anal area dusky.

Holotype: ♀ July 12, 1917, Deming, New Mexico (H. H. Knight), taken on tent used as a trap light; author's collection.

Nicholia new genus.

Pseudarolia large, arising from basal angle of the claw, free and running parallel with claw to the apex; a pair of bristle-like arolia arising between bases

of the claws. Refers to the tribe Oncotylini; allied to *Lopus* Hahn but differs in the free pseudarolia which in form are more like *Macrotylus* Fieb. Antennae thick as in *Lopus* but the head more vertical; eyes prominent, vertical height equal to one and one-half times length of first antennal segment; posterior surface of eyes more transverse than in *Lopus*. Rostrum moderately thick, just attaining hind margins of middle coxae. Pronotum with a slight flat collar on anterior edge as in *Lopus*; lateral margins rounded, slightly sulcate, basal margin broadly and evenly arcuate; calli large but only slightly convex. Scutellum strongly convex, mesoscutum moderately exposed, elevated somewhat above base of scutellum. Hemelytra rather long, cuneus elongate, surpassing tip of venter, membrane fully developed; embolar margins nearly straight or slightly sinuate. Tibiae with six rows of spines nearly as in *Oncotylus guttulatus* Uhler. Male genital structures distinctive; left clasper broadly U-shaped, somewhat thicker on basal half, a dorsal spine at base while the distal incurved portion is somewhat twisted and flattened, the apex lying above base of the small right clasper; chitinous tip of the aedeagus is directed upward and transversely to the left side, not closely supported by the left clasper. Genotype: *Nicholia eriogoni* n. sp.

***Nicholia eriogoni* n. sp.**

♂. Length 4.3 mm., width 1.4 mm. Head: width .80 mm., vertex .36 mm.; frons evenly convex, smooth, tylus straight, forming a right angle with lower margin of bucculae; yellowish, base of vertex and base of tylus more or less fuscous. Rostrum, length 1.2 mm., just attaining hind margins of middle coxae, yellowish, apex black. Antennae: segment I, length .30 mm., thick, constricted at base; II, 1.21 mm., cylindrical, equal to segment I in thickness; III, 1.18 mm., slightly more slender than II; IV, .52 mm., slightly more slender than III; uniformly black. Pronotum: length .80 mm., width at base 1.24 mm.; disk rather evenly convex, lateral margins rounded, not at all angulate; pale to yellowish, disk becoming fuscous, calli brownish, propleura nearly white. Scutellum strongly convex, smooth, pale to yellowish, mesoscutum fuscous.

Clothed with rather prominent, simple, inclined, yellowish pubescence, moderately thick and evenly distributed on the dorsum. Hemelytra pale, disk of corium and of clavus becoming fuscous; cuneus yellow and tinged with reddish. Membrane uniformly fuscous, veins pale. Sternum and sides of venter fuscous. Legs pale yellowish, unspotted, basal half of coxae fuscous, tarsi black, tips of tibiae fuscous; tibiae with six rows of black spines, length of spines not equal to diameter of tibia. Genital structures distinctive, see generic description.

♀. Length 4.6 mm., width 1.77 mm. Head: width .86 mm., vertex .46 mm. Antennae: segment I, length .30 mm.; II, 1.3 mm., slightly more slender on basal half; III, 1.18 mm.; IV, .52 mm.; black. Very similar to the male in general form, color and pubescence.

Holotype: ♂ September 9, 1928, Tucson, Arizona (A. A. Nichol); author's collection.

Allotype: same data as type.

Paratypes: 2♂ 1♀, taken with the types on *Eriogonum* sp. where the species was breeding. 2♂ 1♀, Sept. 13, 1925, alt. 4500 ft., Oracle; 8♂ 9 Sept. 9, 4♂ 2♀ Sept. 4, 1925, Santa Rita Mts., Arizona (A. A. Nichol). ♂ July 22,

1925, Tucson, Arizona (R. B. Streets). ♂ Sept. 7, 1925, alt. 3500 ft., Rincon Mts., Arizona (A. A. Nichol).

The genus is named in honor of Mr. Andrew A. Nichol who has favored the writer with numerous species of Miridae collected in Arizona.

Pronotocrepis new genus.

Claws straight, curved only at tips, pseudarolia prominent, connate with the claw, narrow, slightly expanded and free at tip within the sharp curve near apex of the claw; a pair of bristle-like arolia arise between bases of claws. Claws and pseudarolia much as in *Orectoderes* but the peculiar explanate form of pronotum requires the formation of a new tribe which may be known as *Pronotocrepini*.

Pronotum with lateral margins explanate, straight, broadly and strongly reflexed, basal angles broadly rounded, basal margin sinuate on middle, anterior margin flat with no indication of a collar, fitting closely upon collum and behind the eyes; disk irregularly rugose, sparsely set with short black hairs which arise from shallow punctures; calli moderate, slightly convex, delimited by an impressed line except on outer angles; propleura broadly and deeply sulcate below the explanate lateral margins of disk, coxal cleft extending far up to near anterior angles; xyphus sulcate, lateral margins bluntly carinate. Scutellum moderately convex, mesoscutum somewhat exposed.

Head longer than wide, triangularly produced, slightly inclined; tylus arcuate, scarcely indented at base, merging with the broad evenly convex frons; vertex ecarinate, but with row of short black bristles where vertex merges with collum; eyes suboval, position oblique; gula and genae long, a short suture extending down from base of lora. Rostrum reaching upon third ventral segment, first segment extending to middle of xyphus. Antennae with second segment strongly clavate, first segment only moderately thick, its length not equal to width of vertex, third segment slender. Embolar margins arcuate, cuneal fracture deep, cuneus strongly deflexed; membrane fully developed, large areole normal, smaller areole inconspicuous. Legs moderately thick, tibiae with six rows of black spines which in length do not equal thickness of segment. Dorsum, body, and legs, sparsely set with short black hairs, more recumbent on hemelytra. Genitalia with chitinous tip of aedaeus prominent, turned transversely to the left side, resting within the bend of the rather slender left clasper. Genotype: *Pronotocrepis clavicornis* n. sp.

Pronotocrepis clavicornis n. sp.

♂. Length 5.8 mm., width 3 mm. Head: width 1.18 mm., vertex .62 mm.; a few scattering black bristles on genae as well as frons, red, frons more yellowish, base of vertex pale, apical half of tylus becoming fuscous. Rostrum, length 2.9 mm., reaching upon third ventral segment, reddish brown, becoming fuscous on apical half. Antennae: segment I, length .50 mm., thickness .16 mm., more slender at base, set with short black hairs, reddish brown; II, 2.16 mm., strongly clavate, greatest thickness .21 mm., tapering to more slender at base (.105 mm. thick), dark brownish red, thickly set with short, recumbent, stiff pubescent hairs; III, slender, (broken). Pronotum: length 1 mm., width at base 2 mm.; form described under the genus.

Dorsum dark fuscous brown, embolium and cuneus yellowish white, apex of cuneus infuscated; membrane and veins uniformly dark fuscous. Ventral surface and legs red, darker on venter, xyphus and propleura pale, the latter with a broad red ray across coxal cleft and extending to basal margin; tibiae more yellowish red, spines black, tarsi blackish. Genital orifice large, claspers and aedaeus situated within the distal half; tip of aedaeus large, turned transversely to the left side, resting within the arm of the small left clasper; both claspers much the same type as in *Plagiognathus* but right clasper relatively larger.

Holotype: ♂ August 11, 1925, Ute Creek Ranch, Ft. Garland, Colorado (H. H. Knight); author's collection.

OBITUARY

ERNEST HENRY BLACKMORE

The Entomological Society of British Columbia records with sorrow the death of Mr. E. H. Blackmore, on March 2nd, 1929.

Ernest H. Blackmore was born in Ludlow, Shropshire, England, and came to Canada in 1904 in his early twenties. He lived in Stratford, Ontario, for two years and then moved to Calgary, where he was in the insurance business until entering the Money Order Department of the Postal Services in 1908. Shortly afterwards he was transferred to Victoria, B. C. remaining in the same department and becoming head of it in the Victoria branch in 1921.

From boyhood he was interested in insects, confining his attention, however, to Lepidoptera in general and, after coming to Victoria, to Geometridae in particular. After a visit to the National Collections at Ottawa he became especially interested in the Microlepidoptera and, largely through the encouragement of Mr. August Busck, of Washington and Dr. J. H. McDunnough, of Ottawa, he specialized in this group until his death. His name became identified with the Micros of this Province and his correspondence therewith contains, amongst others, communications from Benjamin, Busck, McDunnough, Casino, Swett, Miss Braun, Comstock, Meyrick, Prout, Schaus and Ottolengui.

His collections, consisting of nearly fifteen hundred species, represented by some eight thousand specimens, were obtained from all over the settled parts of this Province largely through his own efforts, but also through those of his wife and a wide circle of friends to whom he imparted much of his joyous enthusiasm. The exactness with which the Micros especially are mounted, remains as a monument to his painstaking care and attention to minute details.

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